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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

ALANKO, ANITA KAREN

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1765

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Please find below and/or attached an Office communication concerning this application or proceeding.

Am

Office Action Summary	Application No. 10/643,290	Applicant(s) DONALDSON ET AL.	
	Examiner Anita K. Alanko	Art Unit 1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11/7/05 RCE.
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19, 21-25 and 27-29 is/are pending in the application.
4a) Of the above claim(s) 13 and 28 is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1-12, 14-19, 21-25, 27 and 29 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/7/05 has been entered.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-5, 7, 9 and 11 are rejected under 35 U.S.C. 102(b) as being anticipated by Chong et al (US 6,093,330).

Chong discloses a method comprising:

forming a plurality of slot portions 86,88 in a substrate 10 (Fig.11); and,

etching a trench 100,102 (Fig.13) in the substrate contiguous (since it is adjacent and touching the slot portions) with the plurality of slot portions to form a compound slot 104 to connect substrate material on opposite sides of the compound slot (bridges 110, 112 extending between bar 106 and substrate 10, Fig.15 & Fig.17).

As to claim 2, Chong discloses that etching forms a trench having a v-shaped profile (the underside of bar 106, or the ridge 109 at the bottom of the compound slot).

As to claim 3, the bar 106, the curved sides of compound slot 104 and the ridge 109 all comprise walls with angles between 10° and 80° relative to a first surface of the substrate.

As to claims 4-5, 7 and 9, Chong discloses etching 84 to form a plurality of slot portions or vias 86,88 (col.11, lines 14-16, a “vertical” etch comprises an anisotropic etch).

As to claim 11, Chong discloses that at least some substrate material 106 is retained between individual slot portions.

Claims 1-9, 11, 14-19, 21-25, 27 and 29 are rejected under 35 U.S.C. 102(b) as being anticipated by Kawamura et al (US 6,019,907).

Kawamura discloses a method comprising:

forming a plurality of slot portions 40 in a substrate 25 (Fig.5D); and,

etching a trench 44, 48, 50 (Fig.6D, note slot portions 40 are not shown in Fig.6D) in the substrate contiguous (since it is adjacent and touching the slot portions) with the plurality of slot portions to form a compound slot 44 to connect substrate material on opposite sides of the compound slot (“thin bridge of the silicon die 25” col.5, lines 57-58 – the remaining part of die 25 under thin film layer 27 (as shown in Fig.3); since resistors 26 are connected to circuitry 28 (Fig.4), the resistors are also connected to the substrate 25, and therefore a part of the substrate remains after etching to form a reinforcement structure). The figures do not show that the reinforcement structure connects substrate material on opposite sides of the compound slot,

however this is inherent since the circuitry must somehow be connected to substrate material, then the thin silicon bridge upon which the circuitry rests is also connected to substrate material.

As to claims 2-3, trench 44 (also labeled as refill channel 29) has a V-shaped profile with sidewalls oriented at an angle between 10 and 80 degrees (Fig.3).

As to claims 4-7, Kawamura discloses to form a plurality of slot portions or vias 40 (Fig.5D) by laser machining or etching (col.5, lines 11-14).

As to claims 8-9, Kawamura discloses to mask areas 54 on a backside surface of the substrate (Fig.6C) and to anisotropically etch (col.6, lines 1-6).

As to claim 11, Kawamura discloses to etch while retaining at least some substrate material 25 between individual slot portions 40 (see Fig.3 & Fig.4).

As to claim 14, Kawamura discloses exposing both the first and second surfaces (the top and bottom surfaces of the substrate). The reinforcement structure inherently is stronger in bending in or out of a plane compared to if it were not present.

As to claim 15, Kawamura discloses that the terminus has at least two angled walls between 10 and 80 degrees (defined by back-etching to connect trench 44 with feed channels 40, the feed channels have curved walls Fig.5D).

As to claims 16-17, see the rejection of claims 4-5.

As to claim 18, Kawamura discloses to isotropically etch (col.5, line 12).

As to claim 19, Kawamura discloses to position material (mask 54) over at least the second surface (backside Fig.6C) to control the removal of substrate material.

As to claim 21, see the rejection of claim 15.

As to claim 22, the curved sidewalls comprise at least four angled walls, they also inherently reduce bubble accumulation compared to the terminus not being present.

As to claim 23, Kawamura discloses to pattern the first and second surfaces (slot portions 40 and trench 44) and exposing to an etchant (col.5, lines 11-12, 31-32).

As to claim 24, the slot portions 40 have given dimensions and forming a trench portion soes not increase the given dimensions at the first surface (Fig.2, Fig.3).

As to claim 25, the slot portions 40 extend through less than a majority of the thickness (Fig.5D, Fig.3).

As to claim 27, see the rejection of claims 4 and 14.

As to claim 29, Kawamura discloses to form an array of fluid-ejecting devices (as seen in Fig.2 & Fig.3). An array includes forming a plurality of fluid-handling structures 30. Kawamura also discloses etching through the fluid-handling structures (Fig.5D & Fig.6D) to form a trench in fluid-flowing relation with the slot portions (so that ink can be delivered through the nozzles 16).

Claims 1-5, 7-12, 14-19, 21-25, 27 and 29 are rejected under 35 U.S.C. 102(e) as being anticipated by Milligan et al (US 6,555,480).

Milligan discloses a method comprising forming a plurality of slot portions and etching a trench to form a compound slot such that at least one reinforcement structure extends across the compound slot (Fig. 2B – see part of layer 120 that is surrounded by ink channels 129, Fig.3, col.8, lines 25-39). Milligan also discloses to form slots and trenches (openings in 112, 102, or

also Fig.6A and 7B) using masking 122,124 and etchant 140, a plurality of times (since high density of slots in given die, col.2, lines 19-20).

Claims 1-9, 11-12, 14-19, 21-25 are rejected under 35 U.S.C. 102(e) as being anticipated by Soik et al (US 6,745,469 B1).

Soik discloses a method comprising:

forming a plurality of slot portions 308 in a substrate 302 (Fig.14); and

etching a trench 310 (or the portions could be reversed, slot 310 and trench 308) in the substrate contiguous with the plurality of slot portions to form a compound slot such that at least one reinforcement structure (beam formed from material relief 322) extends across the compound slot (to form beams that provide strength, col. 2, lines 37-42; col.14, lines 38-42).

As to claim 2, Soik discloses to form a v-shaped profile (col.10, line 49).

As to claim 3, Soik discloses to form first and second sidewalls (354 or 352, chamfers, Fig.16) that are oriented at an angle of between 10 degrees and 80 degrees relative to the first surface 304.

As to claims 4-5, Soik discloses to form a plurality of slots or vias (Fig.11).

As to claims 6-7 and 12, Soik discloses to laser machine or etch (col.14, lines 38-42).

Broadly interpreted, grinding, water jet cutting or electrochemical machining is wet etching.

As to claim 8, the method of etching inherently requires masking in order to form the slot selectively in the surface of the substrate.

As to claim 9, the V-shaped profile is anisotropic.

As to claim 11, Soik discloses to retain material between slots (Fig. 11).

Further, as to claim 14, Soik discloses to form a reinforcement structure 322, 334 (Fig.14), which makes the substrate stronger.

As to claim 15, see claim 3. The chamfers comprise two angled walls.

As to claims 16-17, see the rejection of claims 4-5.

As to claim 18, the EDM of Soik is expected to be isotropic.

As to claim 19, selectively etching in Soik inherently requires positioning a material to control removal of substrate material.

As to claim 21, Soik discloses angled walls, (Figures 14, 21 and 22; e.g., 402 or sidewalls 308).

As to claim 22, Soik discloses angled walls, e.g. chamfers (Fig.16), and sidewalls of opening 308 (Fig. 14).

As to claim 23, see the rejection of claims 8 and 19.

As to claim 24, the method of Soik is not expected to increase the given dimensions.

As to claim 25, the method of Soik discloses to form portions that extend through less than a majority of the thickness (310 or 308).

As to claim 26, Soik discloses to form sidewalls at greater than 10 degrees and less than about 90 degrees (Fig.14).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kawamura et al (US 6,019,907) in view of Adams et al (US 6,753,638 B2).

The discussion of Kawamura from above is repeated here.

As to claim 10, Kawamura fails to teach alternating acts of etching and passivating. Adams teaches that a common method for forming trenches comprises using alternating acts of etching and passivating (col.12, lines 44-47). It would have been obvious to one with ordinary skill in the art to use alternating acts of etching and passivating in the method of Kawamura because Adams teaches that this is a conventional, useful etching technique.

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kawamura et al (US 6,019,907) in view of Wood et al (US 6,942,814 B2).

The discussion of Kawamura from above is repeated here.

As to claim 12, Kawamura fails to teach wet etching. Wood teaches that wet etching is a useful, alternative technique for forming trenches 18 compared to dry etching (col.7, lines 54-60). It would have been obvious to one with ordinary skill in the art to use wet etching in the method of Kawamura because Wood teaches that this is a useful, alternative etching technique for dry etching to form trenches.

Response to Amendment

The claims remain rejected over Milligan and Soik. Kawamura and Chong are newly applied for disclosing a method for forming a compound slot that has at least one reinforcement structure that extends across the compound slot to connect substrate material on opposite sides of the compound slot.

Applicant's arguments filed 11/7/05 have been fully considered but they are not persuasive. Applicant argues that the limitation of the reinforcement structure that extends across the compound slot to connect substrate material on opposite sides of the compound slot is not disclosed by Milligan or Soik. Examiner acknowledges that the ledges shown in Figure 13 or other sidewall features of substrate 102 do not extend across the slot, however another embodiment of Milligan does have a structure that extends across the slot (Fig.2B). Since the ink channels 129, firing chamber 130 and trench 126 are in fluidic connection, the material 120 that remains within the fluidic cavity is a reinforcement structure that extends across the compound slot. Similarly, Soik discloses that slot portions 310, trenches 308 and openings 336 within residual material 334 (through which fluid flows) are all in fluidic connection, and the material that remains of the residual material form a reinforcement structure (the beams).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anita K. Alanko whose telephone number is 571-272-1458. The examiner can normally be reached on Mon-Fri until 2:30 pm (Wed until 11:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Anita K. Alanko
Anita K Alanko
Primary Examiner
Art Unit 1765